

What is claimed is:

1. In a computer system for managing resources, a method for displaying managed object data associated with managed resources, the method comprising the steps of:

5 receiving at least one managed object selection and receiving a task selection to apply to the at least one managed object selection;

identifying at least one view definition corresponding to the task selection that defines a view with which to display managed object data related to the at least one managed object selection;

10 displaying the view corresponding to the at least one view definition on a graphical user interface of the computer system;

obtaining the managed object data related to the at least one managed object selection; and

15 displaying the managed object data related to the at least one managed object selection within the view on the graphical user interface of the computer system.

(get data dictionary, display master view)

2. The method of claim 1 further including the steps of:

20 retrieving a data dictionary containing a master view definition, task definitions, view definitions and managed object data definitions, the data dictionary further defining, for each task definition, at least one use case that defines a mapping of at least one view definition to a portion of at least one managed object data definition; and

25 displaying the master view definition on the graphical user interface such that a user of the computer system can provide the at least one managed object selection and a task selection that are received in the step of receiving.

(determining view applies object selection to use case of task)

3. The method of claim 2 wherein the step of identifying at least one view definition corresponding to the task selection comprises the steps of:

selecting a task definition in the data dictionary that corresponds to the task selection; and

for each of the at least one object selection, selecting a use case that is associated with the task definition in the data dictionary and that corresponds to the at least one object selection, the use case identifying a view definition defining a view in which to display managed object data related to the at least one managed object selection to which a management function associated with the task selection is applied.

(step of displaying view gets view type and renders view)

4. The method of claim 2 wherein the step of displaying the view definition comprises the steps of:

for each of the at least one view definition identified in the step of identifying:

- i) retrieving a view type from the at least one view definition in the data dictionary, the view type defining a view to be displayed on the graphical user interface of the computer system; and
- ii) rendering a view corresponding to the view type on the graphical user interface of the computer system.

(view style)

5. The method of claim 4 wherein the step of rendering a view corresponding to the view type renders the view according to a view style defined in the data dictionary.

6. The method of claim 5 wherein the view style defines a view corresponding to at least one of a map, a tree and a graph.

(get object data referenced by view definition)

7. The method of claim 2 wherein the step of obtaining the managed object data comprises the steps of:

consulting the at least one view definition in the data dictionary to identify the managed object data references related to the at least one managed object selection that reference managed object data that is to be displayed in the view definition; and
obtaining the managed object data based upon managed object data references.

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(get object data in data dictionary or from server)

8. The method of claim 7 wherein the step of obtaining the managed object data includes the step of:

determining if the managed object data is contained in the data dictionary, and if
the managed object data is contained in the data dictionary, the managed object data is
obtained from the data dictionary, and if the managed object data is not contained in the
data dictionary, the managed object data is obtained from a management server that
provides the managed object data.

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(obtaining object data first applies management function associated with task)

9. The method of claim 7 wherein the step of obtaining the managed object data further comprises the steps of:

invoking a management function associated with the task selection upon managed
object data associated with at least one of the at least one managed object selection to
produce managed object data which is referenced by the managed object data references
defined within the view definition.

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(display object data provides data to view, renders data in view)

10. The method of claim 2 wherein the step of displaying the managed object data
comprises the steps of:

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providing the view displayed on the graphical user interface of the computer
system with the managed object data obtained as a result of the step of obtaining; and
rendering the managed object data in the view.

30 (view style)

11. The method of claim 10 wherein the step of rendering the managed object data renders the managed object data according to a managed object data style defined in the data dictionary for the managed object data.

5 (dd is XML dom tree provided from XML parser operating on ECC server)

12. The method of claim 2 wherein the data dictionary is a document object model based upon parsing operations performed on a collection of markup language statements that define task definitions, view definitions, and object definitions.

10 (SAN environment, management function applies to resource, results displayed)

13. The method of claim 12 wherein:

the object definitions in the document object model define attributes and data of resources in a storage area network environment;

15 the task definitions identify resource management functions which may be applied to the resources in the storage area network environment; and

wherein the step of obtaining the managed object data includes the step of:

applying a resource management function associated with the task selection upon a resource in the storage area network environment corresponding to the managed object selection to produce managed object data which is referenced by the managed object data references defined within the view definition; and

20 wherein the step of displaying the managed object data displays the managed object data in the graphical user interface to allow a user of the computer system to view results of application of the resource management function on the resources in storage area network environment.

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(SERVER)

14. In a management server computer system, a method providing access to managed object data, the method comprising the steps of:

30 parsing a view definitions document, an object definitions document and an object data document to create a data dictionary containing a master view definition, task

definitions, view definitions and managed object data definitions, the data dictionary further defining, for each task definition, at least one use case that defines a mapping of at least one view definition to a portion of at least one managed object data definition;

detecting an initiation of a resource management process; and

- 5 passing the data dictionary to the resource management process to allow the resource management process to process the data dictionary.

15. The method of claim 14 further including the steps of:

- 10 receiving a request from a resource management process for managed object data associated with a particular managed resource;
- invoking operation of a resource agent operating in conjunction with the managed resource to produce and return the managed object data;
- receiving the managed object data from the resource agent; and
- providing the managed object data to the resource management process.

15 16. The method of claim 15 wherein the method operates in a resource management application used for management of managed resources in a storage area network environment and wherein the view definitions document, the object definitions document are XML documents defining task selections that can be applied to managed object
20 selections, and that further define, for certain combinations of task selections and object selections, a use case that references a view definition that defines a view and references managed object data that is to be displayed in the view according to a style definition.

17. A computer system, comprising:

- 25 a display;
- a memory;
- a processor; and
- an interconnection mechanism coupling the display, the processor and the memory;

wherein the memory is encoded with a resource management application that, when performed on the processor, produces a resource management process that provides a graphical user interface for displaying managed object data associated with managed resources on the display of the computer system by causing the computer system to

5 perform the operations of:

receiving at least one managed object selection and receiving a task selection to apply to the at least one managed object selection;

10 identifying at least one view definition corresponding to the task selection with which to present, on the display, managed object data related to the at least one managed object selection;

displaying a view on a graphical user interface on the display of the computer system, the view corresponding to the at least one view definition identified in the step of identifying;

15 obtaining the managed object data related to the at least one managed object selection; and

displaying the managed object data related to the at least one managed object selection within the view on the graphical user interface of the computer system.

(get data dictionary, display master view)

20 18. The computer system of claim 17 wherein the resource management process further causes the computer system to perform the operations of:

retrieving, into the memory, a data dictionary containing a master view definition, task definitions, view definitions and managed object data definitions, the data dictionary further defining, for each task definition, at least one use case that defines a mapping of at

25 least one view definition to a portion of at least one managed object data definition; and

displaying the master view definition on the graphical user interface such that a user of the computer system can provide the at least one managed object selection and a task selection that are received in the step of receiving.

19. The computer system of claim 18 wherein when the resource management process performs the operation of identifying at least one view definition corresponding to the task selection, the resource management application performs the operations of:

selecting a task definition in the data dictionary that corresponds to the task

5 selection; and

for each of the at least one object selection, selecting a use case that is associated with the task definition in the data dictionary and that corresponds to the at least one object selection, the use case identifying a view definition defining a view in which to display managed object data related to the at least one managed object selection to which
10 a management function associated with the task selection is applied.

(step of displaying view gets view type and renders view)

20. The computer system of claim 18 wherein when the resource management process performs the operation of displaying the view definition, the resource management
15 process performs the operations of:

for each of the at least one view definition identified in the operation of
identifying:

i) retrieving a view type from the at least one view definition in the data dictionary, the view type defining a view to be displayed on the graphical user interface of the computer system; and
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ii) rendering a view corresponding to the view type on the graphical user interface of the computer system.

(view style)

25 21. The computer system of claim 20 wherein when the resource management process performs the operation of rendering a view corresponding to the view type, the resource management process renders the view according to a view style defined in the data dictionary.

22. The computer system of claim 21 wherein the view style defines a view corresponding to at least one of a map, a tree and a graph.

(get object data referenced by view definition)

- 5 23. The computer system of claim 18 wherein when the resource management process performs the operation of obtaining the managed object data, the resource management process performs the operations of:

consulting the at least one view definition in the data dictionary to identify the managed object data references related to the at least one managed object selection that
10 reference managed object data that is to be displayed in the view definition; and
obtaining the managed object data based upon managed object data references.

(get object data in data dictionary or from server)

- 15 24. The computer system of claim 23 wherein when the resource management process performs the operation of obtaining the managed object data, the resource management process performs the operation of:

determining if the managed object data is contained in the data dictionary, and if the managed object data is contained in the data dictionary, the managed object data is obtained from the data dictionary, and if the managed object data is not contained in the
20 data dictionary, the managed object data is obtained from a management server that provides the managed object data.

(obtaining object data first applies management function associated with task)

- 25 25. The computer system of claim 23 wherein when the resource management process performs the operation of obtaining the managed object data, the resource management process performs the operation of:

invoking a management function associated with the task selection upon managed object data associated with at least one of the at least one managed object selection to produce managed object data which is referenced by the managed object data references
30 defined within the view definition.

(display object data provides data to view, renders data in view)

26. The computer system of claim 2 wherein when the resource management process performs the operation of displaying the managed object data, the resource management process performs the operation of:

providing the view displayed on the graphical user interface of the computer system with the managed object data obtained as a result of the step of obtaining; and rendering the managed object data in the view in the graphical user interface on the display of the computer system.

(view style)

27. The computer system of claim 26 wherein when the resource management process performs the operation of rendering the managed object data, the resource management process renders the managed object data according to a managed object data style defined in the data dictionary for the managed object data.

(dd is XML dom tree provided from XML parser operating on ECC server)

28. The computer system of claim 18 wherein the data dictionary in the memory is a document object model based upon parsing operations performed on a collection of markup language statements that define task definitions, view definitions, and object definitions.

(SAN environment, management function applies to resource, results displayed)

29. The computer system of claim 28 wherein:

the object definitions in the document object model in the memory define attributes and data associated with resources in a storage area network environment; the task definitions identify resource management functions which may be applied to the resources in the storage area network environment; and

wherein when the resource management process performs the operation of obtaining the managed object data, the resource management process performs the operation of:

applying a resource management function associated with the task selection upon a resource in the storage area network environment corresponding to the managed object selection to produce managed object data which is referenced by the managed object data references defined within the view definition; and

wherein when the resource management process performs the operation of displaying the managed object data, the resource management application displays the managed object data in the graphical user interface on the display to allow a user of the computer system to view results of application of the resource management function on the resources in storage area network environment.

30. A computer system, comprising:

a display;
a memory;
a processor; and
an interconnection mechanism coupling the display, the processor and the memory;

wherein the memory is encoded with a resource management application that, when performed on the processor, produces a resource management process that operates on the computer system causing the computer system to provide:

means for receiving at least one managed object selection and receiving a task selection to apply to the at least one managed object selection;

means for identifying at least one view definition corresponding to the task selection with which to present, on the display, managed object data related to the at least one managed object selection;

means for displaying a view on a graphical user interface on the display of the computer system, the view corresponding to the at least one view definition identified in the step of identifying;

means for obtaining the managed object data related to the at least one managed object selection based upon managed object data references contained in the view definition; and

5 means for displaying the managed object data related to the at least one managed object selection within the view on the graphical user interface of the computer system.

31. A computer program product having a computer-readable medium including computer program logic encoded thereon, that when executed on a computer system having a coupling of a memory, a processor, and a display that displays a graphical user interface, provides a method for displaying managed object data associated with managed
10 resources by causing the processor to perform the operations of:

receiving at least one managed object selection and receiving a task selection to apply to the at least one managed object selection;

15 identifying at least one view definition corresponding to the task selection with which to display managed object data related to the at least one managed object selection;

displaying a view corresponding to the at least one view definition on a graphical user interface of the computer system;

obtaining the managed object data related to the at least one managed object selection based upon managed object data references contained in the view definition;

20 and

displaying the managed object data related to the at least one managed object selection within the view on the graphical user interface of the computer system.

(get data dictionary, display master view)

25 32. The computer program product of claim 30 wherein the computer program logic further includes instructions that, when performed on the processor, cause the processor to perform the operations of:

retrieving a data dictionary containing a master view definition, task definitions, view definitions and managed object data definitions, the data dictionary further defining,

for each task definition, at least one use case that defines a mapping of at least one view definition to a portion of at least one managed object data definition; and

displaying the master view definition on the graphical user interface such that a user of the computer system can provide the at least one managed object selection and a task selection that are received in the step of receiving.

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Approved for Release